NOTES FOR A COMPARISON BETWEEN THE TERTIARY VOLCANIC SUCCESSION IN NORTHWESTERN EUROPE AND IN WESTERN AMERICA.*

After alluding to the remarkably complete record of volcanic action in Britain, the lecturer proceeded to describe the most extensive and best preserved of all the volcanic series which is referable to Tertiary time and is remarkably developed from the south of Antrim through the inner Hebrides and Faroë islands to Iceland and Greenland. A general sequence has been noticed in the character of the erupted material. The earliest lavas appear to have been basalts, followed by andesites and, lastly, dacites. The basalts form extensive plateaus, each of which is built up of nearly horizontal sheets. The intrusive rocks included gabbros, ranging into peridotites and other basic materials, granophyres, granites, rhyolites and other acid rocks; the latest intrusions of all returning to the original basaltic type.

The earliest chapter in the Tertiary volcanic history of northwestern Europe brings before us the gradual building up of extensive plateaus of basalt which, in some places, reach a thickness of more than three thousand five hundred feet. These vast outflows of lava appear to have issued chiefly from fissures, like those of Iceland, but with occasional vents, some of which built up cones like those on the surface of the Tertiary lava fields of western America.

The general characters of the Scottish basaltic plateaus were illustrated by a series of lantern slides, and some examples were also given of Icelandic fissures, particularly of the great fissure which supplied the vast lava floods of 1783.

From the great antiquity of these Tertiary lava plateaus they have undergone extensive denudation and dissection, so that their structure is laid bare along many miles of picturesque coast line as well as on the mountain ranges of the interior. Examples of the results of subaëreal waste were displayed on the screen.

Continuing, the lecturer said that when the basalts had accumulated to a great thickness the magma appears to have found easier passage between the strata at the bottom of the volcanic series than upward through fissures; consequently, sheets or sills are found intercalated among the Jurassic rocks which form the base on which the volcanic series rests, while the lower portions of that series have been similarly invaded.

The next epoch in the volcanic history reveals to us the uprise of an infinite number of successive intrusions of basic material in sills, dikes and laccoliths at certain points in the midst of the basalt plateaus. On the whole, these masses consist of gabbros and dolerites, but they included also some beautiful examples of peridotites. There is no evidence that any of these intrusions reached the surface and appeared there in the form of lavas. They seem to have risen by preference at certain points of weakness, such as groups of vents. Examples of the relation between the gabbros and vents of different sizes are particularly observable in the islands of Skye and Mull.

Illustrations of the scenery of the gabbro bosses were shown by means of slides, together with a portion of the crest of the Cuillin Hills, to show the intricate manner in which the material had been injected. There was probably a long interval after the cessation of the gabbro intrusions. When the volcanic energy resumed its activity the composition of the underlying magma had completely changed. Rocks of a thoroughly acid character were now intruded. They took the form of bosses, sills and dikes, but there is no

*Abstract of a lecture by Sir Archibald Geikie given before the Geological Society of Washington on May 5th.

proof in any case that they flowed out at the surface as lavas. Like the gabbros, they were developed in special centers and preferentially in the areas already chosen by the gabbros; hence, the black, rugged mountains of gabbro are very generally accompanied by more or less regularly formed cones of granite and granophyre. These two cones not only form a striking contrast to the gabbros as regards their contour, but also in their colors. They range through various tints of yellow and russet. The characteristic scenery of central Skye, with the dark, rugged outlines of the gabbros on the west and the smooth, pale cones of the Red Hills on the east, depends upon this difference of geologic structure.

The latest phase in the volcanic history is marked by the uprise of another great series of basic dikes which, like those of the earlier time, follow a generally northwesterly direction and rise even through the latest masses of granophyre. On the flanks of the Red Hills of Skye long, dark ribs of rock may occasionally be seen even from a distance, which mark the last efforts of the Tertiary volcanoes of Britain.

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*SOME PHASES OF WEED EVOLUTION.**

THE common statement that "a weed is a plant out of place" is by no means satisfactory or final to the student. He is still left to ask how it is that certain species have such pronounced ability for getting out of place. Almost any plant may accidently get where it is not wanted, but comparatively few usually and persistently get in the way. A bad weed species is aggressive and persistent. What qualities make it so?

As a partial answer I would suggest four life attributes as follows: 1. Great reproductive power. 2. Good provision for dissemination. 3. Various protective expedients. 4. Variability.

The statement that a species, to rank as a bad weed, should have large reproductive power needs no elucidation. It is not even necessary to demonstrate that weed species are thus equipped. Dozens of striking examples will occur at first thought.* We should also remember that many of the worst weeds have a double resource for their multiplication; *i. e.*, they propagate themselves by buds as well as by abundant seeds. The Hawkweed throws out stolons; and a Canada Thistle chopped into 20 pieces by the hoe becomes 20 Canada Thistles.

It is also axiomatic that facility of dissemination is one of the qualities of a weed species.

Some weeds make headway by means of special contrivances for avoiding disaster. Certain ones can withstand hard drought. Others have such deep roots as to be beyond the reach of ordinary cultivation. The Dandelion, often cut down by the lawn mower, bears its feathery tuft of seeds on a stem so short as to escape the gardener.

But variability is the chief and most significant quality of a weed species. Moreover, variability is ultimate. And those characteristics already mentioned are all involved in variability; for each one—reproduction, dissemination, protection—may vary, and through selection be indefinitely modified. In this sense, however, variability is not coordinate with the other qualities mentioned.

Other things being equal, then, that species which is most variable is apt to become a weed. This point may be illustrated, though perhaps not demonstrated by reference to some statistics of weed floras. Thus, starting with the proposition that variability is roughly proportional to the number of members in a systematic group,

* Notes from a lecture before the University of Vermont Botanical Club.

* cf. Kerner, 'The Natural History of Plants,' II., 878.